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Performing weeds: Gardening, plant agencies and urban plant conservation

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ABSTRACT

Private domestic gardens have been the site of diverse inquiry in both the social and natural sciences. Intersected by these inquiries this paper focuses on how 'weeds' are (re)constituted through gardening practices in domestic gardens in Christchurch, New Zealand. The paper arises out of an interdisciplinary ecological and social scientific study of the factors influencing the distribution and regeneration of 12 bird-dispersed native woody species from Riccarton Bush, an urban forest remnant of significant ecological rarity, into surrounding residential properties. As part of this study we were especially interested in how people's everyday experiences and encounters in their gardens guide their gardening practices and what possibilities, if any, these create for self-introduced native seedlings to establish, and mature into adults. Drawing inspiration from literatures on human–plant relations we use the concepts of performance, non-human and 'planty' agencies to argue that weeds are *performed* by people and plants rather than having a pre-determined or pre-figured meaning. Empirically the paper seeks to highlight the diverse, unique and disruptive agencies of plants. Methodologically it reflects on ways of engaging with and researching human–plant relations. In concluding, the paper examines how concepts of performance, non-human and planty agencies can provide insights for weed management and urban plant conservation.

Introduction

This paper focuses on gardening practices in private domestic gardens in Christchurch, New Zealand. Such gardens are the site of diverse inquiry. Social scientists have revealed that they are places with multiple, sometimes contradictory, roles and meanings (Francis and Hester, 1990; Longhurst, 2006). They are private havens (Blomley, 2005), functional spaces for leisure and household duties (Williams, 1995), and sites where individuals express their own identity and creativity (Bhatti and Church, 2001). Gardens are also freighted with public responsibility, notably maintaining a garden that conforms closely to the aesthetics of one's neighbours (Blomley, 2005). Thus they are sites of cultural consumption (Chevalier, 1998) where the design, maintenance and conspicuous display of plants and associated elements can be attributed to one's pride and status. Gardens are closely associated with gardening practices, characterised by planning, decision-making, physical work, and expert and lay knowledge about cultured nature (Bhatti and Church, 2001). The roles and meanings of, and the activities associated with, the garden, are structured by personal practices, often reflecting relationships with friends and family, and a variety of wider social and economic influences (Bhatti and Church, 2000, 2001). These various practices influence the ways people create and manage their gardens over the course of their lives, shaping both the garden and its place-meanings (Bhatti, 2006; Perkins and Thorns, 2001).

Moreover, attention is increasingly being turned towards the diverse assemblages of non-humans, including plants, animals, insects, tools and chemicals, materially and actively present in the garden (Ginn, 2013; Hitchings, 2003; Power, 2009; Robbins and Sharp, 2003). Importantly, domestic gardens are one site

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where a growing body of literature on human–plant relations and the non-human agencies of plants is redressing the "ghost-like presence" of plants in empirical and theoretical accounts of social life (Head and Atchison, 2009; Jones and Cloke, 2002, p. 4). Here, some have focused on the hybridity of gardens (Franklin, 2001) demonstrating how they are continuously co-constituted by humans, plants and various non-human beings and entities who occupy these spaces together (Hitchings, 2003; Power, 2005). Elsewhere writers have highlighted the cultural contingency of apparently straightforward ecological categories of natives, exotics, invasives, aliens, and weeds, and their varied associations with questions of belonging and exclusion of Others (Gröning and Wolschke-Bulmahn, 2003; Olwig, 2003). Attempts have also been made to consider 'plantiness' or 'planty' agencies by being attentive to wheat (Head et al., 2012), invasive plants (Atchison and Head, 2013) and grape vines (Brice, 2014).

Domestic gardens have also received attention from natural scientists. They have investigated the composition and diversity of plant (Thompson et al., 2003) and invertebrate species (Vergnes et al., 2013), the use of gardens by birds (French et al., 2005) and other wildlife (DeStefano and DeGraaf, 2003) and land-cover composition and changes at various spatial scales (Mathieu et al., 2007). Furthermore, as the long-term viability of plant and animal populations is increasingly threatened by the effects of urbanisation, population growth, resource demand and climate change (Dawson et al., 2011; McKee et al., 2004; McKinney, 2002), the roles gardens might play in sustaining and conserving biodiversity are being debated (Cameron et al., 2012; Goddard et al., 2010). Encouragingly, gardens can be sites of relatively high plant (Smith et al., 2006), invertebrate (Matteson and Langellotto, 2010) and bird diversity (Chamberlain et al., 2009). Equally the diversity and composition of gardens can hinder attempts to conserve biodiversity. Gardens act as important sources of exotic plants that spread into (Duguay et al., 2007; Sullivan et al., 2005), and have damaging impacts on, areas of native vegetation (Mack et al., 2000; Williams and West, 2000). Critically, many species introduced as ornamental garden plants have (Esler, 1988; Reichard and White, 2001) or will potentially become invasive (Crooks, 2005; Sullivan et al., 2004). Consequently, reducing the impacts of exotic garden plants and realising their biodiversity potential will require modes of engagement that encourage changes in the composition and management of private domestic gardens (Goddard et al., 2010; Loram et al., 2011).

This paper is intersected by these diverse social and natural science inquiries. It focuses on how 'weeds' are (re)constituted through gardening practices in domestic gardens in Christchurch, New Zealand. The paper arises out of an interdisciplinary ecological and social scientific study of the factors influencing the distribution and regeneration of 12 bird-dispersed native woody species from Riccarton Bush, an urban forest remnant of significant ecological rarity, into surrounding residential properties. As part of this study we sought to gain an appreciation of people's interpretations of, and practices associated with, trees, particularly native species, in their gardens. We were especially interested in how people's everyday experiences of, and encounters in, their gardens guide their gardening practices and what possibilities, if any, these create for self-introduced native seedlings to establish, and mature into adults. This stemmed from a desire to understand the contribution of domestic gardens to the conservation of urban forest remnants (Doody et al., 2010).

Drawing inspiration from literatures on human–plant relations and the concepts of performance, non-human and planty agencies we argue that rather than having a pre-figured meaning, weeds are *performed* together by people and plants. In developing this argument we contribute to debates in the social sciences and natural sciences in three ways. First, we develop notions of plantiness and planty agencies, suggesting that the ways weeds are (re)constituted by natural scientists *and* domestic gardeners can contribute to interpretations of the diverse, unique and disruptive agencies of particular plant species. Second, methodologically, we reflect on ways of engaging with and researching human–plant relations. Here we illustrate how the presence of a live potted seedling helped to facilitate a particular type of human–plant encounter and allowed us to appreciate how participants might interpret and respond to the embodied agency of a specific plant. Third, we demonstrate how a focus on performance and planty agencies can provide insights for weed management and urban plant conservation in private domestic gardens. In particular, we contend that people's gardening practices create multiple realities and possibilities (cf. Hinchliffe, 2007; Mol, 1999, 2002) for native woody seedlings in different domestic gardens and within an individual garden.

The paper is divided into four sections. First, the ways in which ideas of performance, non-human and planty agencies have been mobilised in the social sciences are examined before elaborating the concept of a weed. Second, the study is contextualised by introducing Riccarton Bush and the research methods used. The third section focuses on self-introduced native seedlings and examines people's everyday conceptions of weeds and how plants *become* weeds as domestic gardens are performed. In concluding we briefly consider the implications of our arguments for understanding planty agencies, weed management and urban plant conservation.

Human–plant relations: performance, non-human agencies and gardens

Notions of performance and non-human agencies have been enlisted to explore relational understandings of nature and place (Whatmore, 2006). Performance draws attention to how "the 'now' and 'here' of time and space are produced" (Cloke and Perkins, 2005, p. 905; Thrift, 1996, 1999). A plural concept, it is typically understood as an activity, something that is *done*, enacted or practiced (see Gregson and Rose, 2000; Thrift and Dewsbury, 2000; Latham and Conradson, 2003). The way performance is deployed by scholars differs markedly. First, Erving Goffman (1959) focuses on how individuals use a range of props and resources, both seen and talked about and unseen and silent, to manage others' impressions of the self. Performances of this type are usually "deliberately scripted, staged, and consumed, and are designed to create a particular impression" (Cloke et al., 2008, p. 245). From this perspective the continued maintenance of lawns and gardens, particularly at the front, can be read as an attempt to create the impression of being a responsible and caring homeowner and neighbour (Blomley, 2005; Nassauer, 1997).

Second, Judith Butler (1990, 1993, 1997) uses a linguistic definition of performativity to argue that discourses of gender do not pre-exist their 'doing' and have to continuously be performed to exist at all. The identities of men and women are learned through the repeated performance of sedimented forms of social practice, which become so routinized as to appear natural (Butler, 1990, 1993, 1997). Subsequently, performativity has been extended from language and culture to thinking about the body (Grosz, 1995), space (Gregson and Rose, 2000; Thrift and Dewsbury, 2000) and nature (Clark, 2003; Jones and Cloke, 2002). Interpreting the body, space and nature as enacted through performance recognises the significance of contexts and representations, but does not presume they are pre-figured by them (Crouch, 2001). Instead, individuals "negotiate contexts and representations through their [embodied] performance of space or nature" (Crouch, 2003, p. 24). Reinterpreted in this manner, Butler's focus on the 'iterative' allows us to start thinking about how, in particular contexts, place and

nature or gardens and weeds, are continuously enacted and re-enacted through a range of embodied and material practices.

Third, Nigel Thrift's (1996, 2000, 2008) non-representational theory stresses "the flow of practice in everyday life as embodied, as caught up with and committed to the creation of affect, as contextual and as inevitably technologized through language and objects" (Thrift and Dewsbury, 2000, p. 415). Here the repetition of gestures, tasks and actions is again emphasised. Gardening practices, for instance, entail a range of repeated movements and physical and material encounters with soil, plants, insects and a variety of other non-humans (Crouch, 2003; Hinchliffe, 2007). Critically, such an account recognises the possibility that variation and difference may "emerge in the spontaneous, creative moments between iterations and the application of codes to contexts" (Szerszynski et al., 2003, p. 3; Thrift and Dewsbury, 2000). Here, nature and place are "figured, discovered, made sense of, challenged, constituted [and] refigured in the multi-sensuous and expressive content" of everyday performances (Crouch, 2003, p. 25). Ideas, desires and feelings about gardens, and who and what belong, therefore, emerge "temporally, unevenly, non-linearly, multiply and perhaps chaotically" out of the varied movements, encounters and reflections associated with practices of gardening (cf. Crouch, 2003, p. 27).

Nature is also increasingly viewed as more than a "set of passive *objects* to be used and worked on by humans" (Macnaghten and Urry, 1995, p. 206). Traditionally gardens have been understood as human achievements in which nature is controlled and ordered through planning, design and physical work (e.g., Chevalier, 1998; Seddon, 1997; Simmons, 1993). In such a depiction only humans are considered to possess agency with nature simply forming the "backdrop for human activity and the material from which gardens are created" (Power, 2005, p. 41; Whatmore, 1999). Following Actor Network Theory (ANT), various non-humans (i.e., plants, animals, insects, machines and tools) are recognised as possessing agency in their own right and *relationally* with humans (Murdoch, 1997; Whatmore, 1999, 2002). This theoretical perspective has relevance for the study of weeds as examples of the relational, unique and disruptive agencies of plants, and it is to natural and social scientific accounts of weediness that we now turn.

Conceptualisations of plants as weeds and planty agencies

'Weedy' plants have evolved alongside humans since the beginning of settled agriculture around 10,000 years ago (Timmons, 1970; Zimdalh, 2007). Timmons (1970) explores the history of mechanical, chemical, biological, scientific and regulatory approaches used to understand and control weeds. He highlights how weeds were (re)constituted through these overlapping approaches. For example, from 1212 to 1249 a Scottish law decreeing "severe penalties to tenants or bond servants who seeded weeds on the land or who did not destroy certain weeds" was so effectively enforced that "weeds were practically eliminated" (Timmons, 1970, p. 295). As studies of classifications emphasise, analytically such legislative and enforcement practices cannot be separated from their historical, social, cultural and political contexts (Douglas and Hull, 1992; Foucault, 1970). Through the "construction of the discontinuous categories and classes" that constitute classifications, such as weeds, "humans and human societies tend to project their own values upon the natural world" (Douglas, 1975; Waterton, 2003, p. 113). Consequently, as Waterton (2003) observes, our replication of classificatory and associated practices are not only 'performative' of "natural, social and moral orderings" (p. 113) but are also "always situated, never wholly replicating, and always containing elements of improvisation, contingency and surprise" (p. 112).

This has certainly been the case in the scientific study of weeds. Since the 1950s, the greater part of the enquiry related to defining, characterising and conceptualising of plants as weeds has been undertaken by natural scientists working in agricultural and pastoral studies, biogeography, biological invasions, weed biology, weed ecology, and weed science (see Radosevich et al., 1997; Vitousek et al., 1997; Zimdalh, 2007). Initially this work focused on classifying weeds and identifying ways of controlling and removing species which competed with crop plants. Increasingly, the devastating effects on native biodiversity and natural ecosystems of species introduced to new habitat ranges by humans have been examined (see Elton, 1958; Mack et al., 2000). Here and in other everyday contexts, the meaning of the term and the ways in which 'weeds' are (re)enacted have been debated. This is because "not all people agree about what a weed is or what plants are weeds" (Zimdalh, 2007, p. 17). Blatchley's definition that a weed is either "a plant out of place or growing where it is not wanted" (1912, p. 6) is the most widely accepted and commonly used (Harlan and de Wet, 1965), perhaps because it leaves much scope for context-specific interpretations.

To overcome the "ambiguous" and valued-laden nature of the term, a number of systems have been developed to classify weeds and assess their threat (see Hulme, 2012; Pyšek, 1995, p. 71). Early researchers such as Baker (1962, 1965, 1974) pioneered work on traits that make plants weedy (Table 1). The main limitation of this approach was "that almost every plant species has some 'weedy' characteristics; however not all plants are weeds" (Radosevich et al., 1997, p. 5). Subsequently, invasion scholars have sought to statistically model and predict how weeds emerge out of the interactions between human activities and plant biology (Diez et al., 2009; Rejmánek, 2000). Important biological characteristics include: (1) an ability to persist in a range of environments; (2) small seed mass; (3) vertebrate dispersed; (4) size of native geographical ranges; (5) capable of vegetative reproduction; (6) not dependent on specific mutualisms (pollinators or seed-dispersers); (7) present in soil associated with human activities (topsoil, mud on cars, horticultural stock) (Pyšek et al., 2009; Rejmánek, 2000).

For us these biological characteristics are examples of planty agencies and material performances of not only species commonly defined or identified as being weeds but plants in general, as we elaborate in Section 'Planty agencies: The unique capacities of plants'. Such classifications also draw attention to differences between the agencies of plants and how they influence social life. Furthermore, models and other weed risk assessment approaches (see Hulme, 2012; Mack et al., 2000) influence how weeds are (re)constituted in institutional and everyday settings (see also Barker, 2008; Atchison and Head, 2013; Qvenild et al., 2014). In New Zealand the Regional Pest Management Strategies administered by Regional Councils and the National Plant Pest Accord

Table 1
Baker's (1974) list of ideal characteristics of weeds.

Characteristic
1. Germination requirements fulfilled in many environments
2. Discontinuous germination (internally controlled) and great longevity of seed
3. Rapid growth through vegetative phase to flowering
4. Continuous seed production for as long as growing conditions permit
5. Self-compatibility but not complete autogamy or apomixy
6. Cross-pollination, when it occurs, by unspecialized visitors or wind
7. Very high seed output in favourable environmental circumstances
8. Production of some seed in a wide range of environmental conditions, tolerance and plasticity
9. Adaptations for short-distance dispersal and long distance dispersal
10. If perennial, vigorous vegetative reproduction or regeneration from fragments
11. If perennial, brittleness, so as not to be drawn from the ground easily
12. Ability to compete interspecifically by special means (rosettes, choking growth, allelochemicals)

prohibits the sale and distribution of the 'worst' weeds (Williams and West, 2000). Risk assessment approaches are used to generate consensus over what constitutes a weed as consistency, both spatially and temporally, is considered essential if management and control is to be effective. Interpretations of what constitutes a weed within, and the composition and management of, domestic gardens can, however, hinder the effectiveness of these initiatives. We argue that weed management and urban plant conservation can be usefully informed by research on human–plant relations within domestic gardens.

Planty agencies: The unique capacities of plants

Social scientists who have explored how plants are actively and materially present in various settings (Jones and Cloke, 2002; Brice, 2014; Power, 2005), have acknowledged the biological characteristics and traits of plants. Plants are "restless life-forms" continuously growing and shedding buds, leaves, flowers, fruit, and maybe bark, as well as, attempting to propagate and spread by seed, rhizomes or suckers, and over time, die (Jones and Cloke, 2002, p. 87). The changes plants undergo, and the different forms they take during their lifecycles, are 'material performances' (Jones and Cloke, 2002, 2008). Such performances are partly attributable to what Head et al. (2012) consider being *unique* capacities of plants (i.e., undertaking photosynthesis, being multicellular, having predominantly cellulose walls), which they term 'planty' agencies (see also Brice, 2014; Hustak and Myers, 2012). These 'planty' agencies are "most tangible when the material textures of plant bodies become embroiled in the conduct of more-than-human social life, and thus become capable of affecting, displacing and transforming human bodies and conduct" (Brice, 2014, p. 5; Hustak and Myers, 2012). Moreover, by being attentive to "modes of human–plant cohabitation" performed within practices, researchers can recognise and perceive the agencies of plants (Brice, 2014, p. 5; Head et al., 2012).

Human–plant cohabitation: affirmation, co-operation and struggle in domestic gardens

Research on human–plant co-habitation in domestic gardens emphasises that the agencies and performances of plants are encountered, negotiated and understood through a range of embodied and material practices. Hitchings (2003, 2007a, 2007b) has investigated how mundane practices in multiple sites are implicated in the re-organisation of domestic gardens in London. In garden centres he (2007a) notes changes in commercial practice including a reduction in the diversity of plants on sale, increased stocks of hard materials (e.g., pots, statues and patio sets) and larger, hardy and striking plants, and retailers offering plant guarantees. Hitchings (2007a, 2007b) attributes these changes to people being increasingly unsure about, and less able and willing to engage with, the lively agencies of plants. Correspondingly, consumers prefer to purchase plant varieties which require less water, light and care, reflecting their desire for gardens which make an immediate 'impact' and largely look after themselves (Hitchings, 2003, 2007a).

A focus on people's practical and physical engagements with plants and other non-humans illustrates, however, that gardens are neither static nor purely human accomplishments. Hitchings (2003) and Power (2005) show gardens are precarious and *relational* achievements where plants, insects and wildlife shape and respond to varying levels of human care and involvement. Here plant performances are valued and appreciated for their shapes, colours, scents and textures, low maintenance qualities, provision of privacy and shade, and the duration and timing of their flowering. Through such performances different plant 'characters' draw people "down into their world, and make for an understanding of their concerns" such as for light, water and nutrients and a "commitment to their care" (Hitchings, 2003, p. 107). Moreover, learning about the needs and requirements of different plants through research, observation and gardening and 'witnessing' these performances continually unfold in strange and unexpected ways with other plants, animals and insects are sources of pleasure and wonderment for many gardeners (Hitchings, 2006; Power, 2005).

Despite recognising their unpredictability, Hitchings (2003, 2006) underplays the more disruptive agencies of plants. Power (2005), in contrast, examines how plant performances help establish, create and reaffirm as well as challenge, disrupt and unsettle people's visions and plans for their gardens in Sydney, Australia. Focusing on weeds she observes how some plants enter "ongoing, competitive relations" (p. 48) with people as they attempt "to ensure their own garden performance" (p. 50). Such plants are often highly mobile, capable of spreading through a central root system or arriving from outside of the property through various dispersal mechanisms (wind, water, shoe treads, lawnmowers and birds), and exploiting available garden conditions that were "not 'designed' to cater to them" (Power, 2005, p. 49; see also Robbins, 2007). These unwanted and undesirable plants and performances are controlled through digging, hoeing, pruning, weeding and poisoning.

Others have considered the implications of such understandings in relation to urban sustainability and environmental management. In an Australian context, Head and Muir (2004, 2006) explore how boundaries both within and outside of domestic gardens are (re)constituted through practice. They (2004) report how people become familiar through their observations of, and struggle with, the disruptive agencies (i.e., prolific growth, heavy seed production, shading of competitors and extensive root systems) of the exotic trees lantana (*Lantana camara*) and camphor laurel (*Cinnamomum camphora*). Despite these struggles and an awareness of their invasive 'status', over time gardeners including native purists, can learn to tolerate or even 'love', mature lantana as they provide habitat for native birds and camphor laurel for climbing, tree houses, swings and shade (Head and Muir, 2004). Similarly, research conducted in Norway illustrates how some gardeners initially value and keep 'black listed' lupin (*Lupinus polyphyllus*) for their colourful performances only to later remove them as they begin to recognise their ability spread (Qvenild et al., 2014).

These accounts highlight the continually emergent relationship between people and plants typified by affirmation, co-operation and struggle. Plants help establish, create and reaffirm people's hopes, needs and desires, for example, for a beautiful, tidy, or practical garden and the sense of place they associate with it. Equally, their performances or agencies can be volatile and unpredictable, sometimes disrupting and unsettling people's experiences of, and ascription of meaning to, their garden (Egoz et al., 2006; Power, 2005). It is in the midst of this dynamic relationship that the practice of weeding is undertaken and we argue weeds are performed together by people and plants.

Accounts of plant performance have implications for weed management and urban plant conservation in two ways. First, they offer an alternative to studies which analyse attitudes towards broad categories such as nativeness and invasiveness (e.g., Bremner and Park, 2007; García-Llorente et al., 2008) and tend to be "rather abstract and mask the details of people's engagements" with such species (Head and Muir, 2004, p. 200; Waitt et al., 2008). Second and relatedly, they highlight the importance of understanding how plants, including those classified 'officially' as 'weedy' or 'endangered', are continually experienced, negotiated and interpreted through embodied and material practices. Such insights can help identify why particular plant varieties are purchased, planted, retained or removed (un)intentionally in different

contexts over time including residential properties in Christchurch, New Zealand. Correspondingly, such a focus highlights the opportunities and challenges for encouraging changes in the composition and management of domestic gardens which might benefit urban forest remnants such as Riccarton Bush.

Context: Christchurch, New Zealand

This paper arose from research that was conducted on residential properties, surrounding Riccarton Bush, an urban forest remnant, in Christchurch, New Zealand. By undertaking this case study we sought to understand:

1. the ecological, social and cultural factors influencing the distribution and regeneration of 12 native bird-dispersed woody species, from Riccarton Bush, into these gardens; and
2. the potential role these residential properties could play in the future of the Bush.

To examine these diverse factors an interdisciplinary research approach was adopted combining methods, concepts and theories from ecology and the social sciences.

Changing interpretations of native and exotic flora in New Zealand

Our paper is set against the background of British colonisation of New Zealand. The arrival of colonists from 1840 systematically supplanted the Māori, the first peoples of the country, and their economy, with a larger European settler population and a new set of globalised economic arrangements. This process was the beginning of a dramatic transformation of the biota and landscapes of New Zealand including the removal of much native forest and other vegetation to make way for agricultural and urban development (Pawson and Brooking, 2002). New plants were introduced and became dominant in agricultural and urban landscapes (Druett, 1983), including domestic gardens (Pawson and Brooking, 2002).

Historical studies point to an appreciation by a *minority* of artists, scientists and nature conservationists of the uniqueness and fragility of New Zealand's native flora during the British colonial period (Leach, 1994; Lochhead, 1994; Sinclair, 1986) and in some instances this led to reservation status for particular landscapes and sites. Relatively recently as non-Māori New Zealanders have developed a much stronger sense of cultural separation from Europe a set of popular identities has emerged centred on the uniqueness of the broad range of New Zealand's native flora and its habitats rather than just a few iconic plant species. In many communities, native plants are now seen as sometimes endangered, valuable, something to be celebrated, conserved, more widely planted or allowed to disperse and proliferate naturally.

This, for instance, is reflected in *The New Zealand Biodiversity Strategy* where it is argued that: "*Our indigenous biodiversity—our native species*, their genetic diversity, and the habitats and ecosystems that support them—is of huge value to New Zealand and its citizens; to our economy, our quality of life, and *our sense of identity* as a nation" (2000, p. ii, authors' emphasis). Notably, introduced or exotic plants are often now denigrated as 'foreign' or 'other' in a number of local, regional and national contexts. This reassessment is hotly contested by those who continue to value introduced plants in domestic and urban amenity settings. These contests over the meaning and value of native and exotic plants create opportunities for new directions in the study of New Zealand's urban ecology (see also Ginn, 2008). More specifically, they provide a context in which the performances, meanings and conservation possibilities of plants dispersed to neighbouring domestic gardens from urban native forest remnants such as Riccarton Bush can be studied and understood.

Seed source: Riccarton Bush

Riccarton Bush is a 7.8 ha fragment of old growth lowland podocarp and mixed broadleaved forest (Molloy, 1995) surrounded by the urban matrix of Christchurch (Fig. 1). Dominated by kahikatea (*Dacrycarpus dacrydioides*), a tall tree which reaches up to 30 m high in the Bush, it is the only surviving remnant of alluvial flood plain forest in Christchurch. Prior to human settlement such areas of forest had been scattered throughout extensive areas of flood plain in lowland Canterbury (Knox, 1969) but were burned by Māori or felled by Europeans for timber, making way for pastoral and then later urban land uses. The survival of the remnant owes much to the Deans family who settled adjacent to the Bush in 1840 and conscious of the rapid transformations taking place in the Canterbury region set it aside in 1854 (Thomson, 1995). 'Deans Bush' remained under their guardianship until 1914 when it was formally renamed Riccarton Bush and protected under the *Riccarton Bush Act 1914* (Thomson, 1995).

In 1924, Dr. Leonard Cockayne, botanist and pioneer ecologist, wrote the following regarding the importance of and need to preserve Riccarton Bush (pp. 12–13):

> [D]o those to whom [Riccarton Bush] belongs – not the people of the district alone, but all New Zealanders – recognise how beyond price is this piece of ancient forest? Do they understand it is the last tree-association of the kind in the whole world? Do they know that, if destroyed, it can never be replaced? Do they comprehend that it is an open-air museum of living organisms themselves belonging to species of great age, whose ancestors, far older, came to New Zealand in the dim past?

The ecological significance of Riccarton Bush is even more apparent today. The closest comparable kahikatea remnant, which covers only 6 ha, is 28 km away and Christchurch is a city where mainly European exotic plant species dominate (Stewart et al., 2004). Nationwide, only 2% of pre-settlement kahikatea forest remain (Taylor and Smith, 1997). For a number of native woody species, Riccarton Bush is their only locality in Christchurch (with rare cultivated exceptions). If these and other species in the Bush do not expand into the surrounding urban matrix they will likely remain vulnerable to localised extinction in the long term due to ecological processes common in small, isolated populations (see Aguilar et al., 2006; Ewers and Didham, 2006; Hanski, 1999; Young et al., 1996). Evidence suggests that such processes have already had a significant influence, as from 1870 to 1993, the reported number of native vascular plant species in the Bush declined from 106 to 67 (Norton, 2002).

Fig. 1. Residential properties in Christchurch, New Zealand with the predominantly kahikatea (*Dacrycarpus dacrydioides*) canopy of Riccarton Bush in the backdrop.

Table 2
Botanical characteristics and occurrence in Riccarton Bush for the 12 native species in the study.

Species	Family	Comments about presence[c]
Aristotelia serrata (Forster et Forster f.) W. Oliver	Elaeocarpaceae	Natural and planted; increasing
Carpodetus serratus Forster et Forster f.	Escalloniaceae	Natural and planted; increasing
Coprosma robusta[a] Raoul	Rubiaceae	Common
Coprosma rotundifolia Cunn.	Rubiaceae	Common
Cordyline australis[a] (Forster f.) Steud.	Agavaceae	Common
Dacrycarpus dacrydioides[b] (A. Rich.) Laubent.	Podocarpaceae	Common
Elaeocarpus dentatus (Forster et Forster f.) W. Oliver	Elaeocarpaceae	Always present; four adults, several saplings, many seedlings
Elaeocarpus hookerianus Raoul	Elaeocarpaceae	Common
Lophomyrtus obcordata Hook. f.	Myrtaceae	Common
Melicytus ramiflorus Forster et Forster f.	Violaceae	Dominant hardwood
Pennantia corymbosa Forster et Forster f.	Icacinaceae	Natural and planted; increasing
Streblus heterophyllus (Blume) Corner	Moraceae	Common

[a] Indicates locally widespread species.
[b] The only gymnosperm of the species; all others are angiosperms.
[c] Molloy (1995).

Ecological data collection

The ecological fieldwork involved recording individuals of 12 study species found on 90 randomly selected residential properties within a 1.4 km radius of Riccarton Bush (Doody, 2008; Doody et al., 2010). Notes, garden maps and photographs were made on each property. Soil samples were collected from the first 31 properties with at least one tree $\geqslant$8 m tall (being likely bird perches). The study species were native, bird-dispersed, woody, plants comprising ten 'Riccarton Bush species' and two 'locally widespread species' (see Table 2). The Riccarton Bush species chosen met these criteria:

1. not typically planted in residential gardens,
2. not typically sold at garden centres or plant nurseries,
3. an easily identifiable juvenile form; and
4. were described in Riccarton Bush plant records (Molloy, 1995) as being reasonably common.

The widespread species were chosen on the basis that they were common in residential gardens, public parks and reserves (Stewart et al., 2004) and naturally occur in the Bush. Their inclusion was intended to help control for any confounding association between proximity to the Bush and environmental conditions favouring seedling establishment (e.g., better soil conditions near the Bush). All data collection was carried out between July 2005 and June 2006 and properties were visited in random order.

Social data collection

The social fieldwork utilised qualitative interviews (Lofland et al., 2006), garden tours (Hitchings and Jones, 2004) and a quantitative questionnaire survey (de Vaus, 2002). Sixteen in-depth interviews and garden tours were conducted from June to August 2006, with a random subset of residents from the 90 properties visited in the study. Interviews were predominantly conducted with the person most involved with the garden on the property and covered a variety of topics including: gardening practices, weeds, trees and Riccarton Bush. After each interview we asked participants to show us what they had recently been doing in their garden. These tours helped to contextualise and develop earlier discussions as walking around we were "constantly reminded of the material presence of the plants" and their role in co-producing the garden (Hitchings, 2003, p. 103). The colour, shape and size of particular species, and the ability of others to grow and spread, were frequently discussed. Moving around, many participants physically engaged with a range of plants, pulling out 'weeds', removing dead leaves and branches, and picking up fallen leaves. Ethnographic notes and digital photographs were taken during these tours. The interviews and tours were analysed using thematic content analysis (Lofland et al., 2006).

The recurring themes identified in the interviews and tours were used to construct a quantitative questionnaire survey (Tashakkori and Teddlie, 2003) that was administered at most of the residential properties (see Doody, 2008). Eighty-five questionnaires were completed at 90 properties sampled. Efforts were made to conduct the survey with the person responsible for looking after the garden. The survey was interviewer–administered and consisted of a series of close-ended and open-ended questions. It elicited information about respondents' gardening practices including: time spent on each practice, methods of removing weeds and preventing them establishing, and the treatment of weeds and self-introduced plants in various parts of the garden.

During the survey, respondents were presented with a live potted kahikatea seedling (Fig. 2) and asked if they knew what it was and how they would treat it if it was to become established in their garden. Our approach had two aims. First, building on the garden tours, presentation of the live seedling was an attempt to facilitate another form of human–plant encounter. We were particularly interested in whether the presence of the seedling might encourage people to be reflexive about how they engage with self-introduced seedlings in the course of gardening. Second, we sought to understand how people interpret and respond to the embodied agency of a specific plant. We now discuss the roles people and plants play in the co-constitution of domestic gardens.

Performing weeds in domestic gardens

The types of gardens our respondents attempt to create and maintain included a mixture of styles and native and exotic plant species (Barnett, 1995; Leach, 2002). Some form of gardening was practiced on all participants' properties. The time committed to such practices varied considerably, but on average they reported spending approximately 2 h a week gardening throughout the year.[4] For many, such as Rebecca,[5] the garden demands constant attention: "I do it all the time and I just do it because it needs to be done... [I am] constantly doing things to try and keep on top of [the garden]". The gardening practices Rebecca and others were

[4] Mean: 168 min (±16.7); median: 120 min; range: 7.5–630 min. Note this excludes time spent on lawn maintenance, spraying, and watering the garden.
[5] Pseudonyms have been used for all research participants.

Fig. 2. The live potted kahikatea seedling that was presented to participants during the survey as a way understanding how they engage with self-introduced seedlings while weeding the garden.

performing and the proportion of time taken to carry them out (see Table 3), changed throughout the year:

> In the winter [there] is leaf raking by the mile and that takes a lot [*laughs*] of time and energy, very good for keeping warm. And really right [through] until July the leaves come [and] I guess April onwards they start. So that's a big job and takes me a lot of the time. And the pruning [*laughs*] starts in the winter. The roses seem to take a lot of time. Then the spring comes and dead heading roses and ... the lawn mowing begins. After that there are times I actually do sit in the garden [*laughs*] but not really. And the weeding, and I do try to keep the place sort of reasonably tidy... So I do a bit of weeding here and there. And then the autumn comes and we have a plum tree which has huge quantities of plums so that seems [*laughs*] to take a lot of sorting out. Cleaning and all the rest of [it] and then we are back to winter again. So there are different things but it is constant (Jennifer).

Jennifer's account highlights how the garden is made continually during the year through a range of embodied, sensuous and skilled practices. It also shows the active role plants play in co-constituting the garden as different species' lifecycles respond to variations in humidity, temperature and sunlight during the seasons and, in turn, shape what needs to be done.

Table 3
Percentage of time spent on different garden tasks (not including maintaining the lawn, spraying and watering) during the seasons.

Season	Weeding	Raking	Fertilising	Planting	Maintenance
Spring	56.2	0	6.3	12.5	25.0
Summer	55.6	27.8	5.6	5.6	5.6
Autumn	37.5	37.5	0	0	28.6
Winter	31.3	15.6	6.3	0	46.9

Participants provided multiple reasons for attempting to control, maintain and respond to the changing performances of plants. An appreciation of the agencies of plants underpinned many responses. Left unattended, many observed plants could and would 'take over' the garden. Jim suggested that this is even more of a problem given New Zealand's temperate climate as plant "growth is so prolific ... that if [the garden] is not tended it really runs riot". There is a sense of the possibility here of plants in the garden creating something else through their prolific growth. In the absence of a gardener, the garden will lose all of its order becoming a disorderly, unruly disturbance, a riot.

Many reported how the uncontrolled growth and development of plants contributes to the perception that the garden is neglected, abandoned and messy (see Blomley, 2005; Nassauer, 1997). Maintaining a neat and tidy garden, and hence avoiding such a perception, as the earlier account from Jennifer illustrates, requires a great deal of time and energy. Weeding, which involves the removal of plants by hand, sometimes with the use of a trowel, or digging out or hoeing areas of garden, is particularly time consuming and labour intensive (Table 3; Vissoh et al., 2007). This emphasis on the work inherent in gardening illustrates how people experience and encounter the non-human agency of plants through embodied practices. In the remainder of this section we highlight how these practices are implicated in the ways weeds are continuously performed in domestic gardens. In a number of instances, the plants performed as 'weeds' resemble plants that are performed as 'weedy' in the scientific and institutional contexts we described earlier.

Everyday conceptions of weeds

The meaning of the term "weed" for participants was ambiguous, encompassing such multiple and overlapping interpretations as: unwanted plants, plant-out-of-place or plants that display 'weedy' characteristics or traits. The elusiveness and complexity of the concept, we suggest, can be attributed to its 'performativity'. Weeds only exist in the doing of them; they have to be continually performed to exist at all (cf. Butler, 1997). This was highlighted in a number of accounts provided in response to the question "when someone uses the term weed what do you think they mean?", including the following example:

> **Michael** A plant that's not desirable in the position ... basically. So it could be anything. It's like ... foxglove you know really cool stuff, very nice but generally for me it's a weed. I don't want to encourage [them]. I use[d] to ... [but] generally now it's a weed where in the past it wasn't. Yeah anything [that is] in my lawns that [is not] grass: Hydrocotyle and all that sort of stuff. Any grass that's in our native or [other] gardens ... is [also] a weed; but all grass in the lawn is qualified [as acceptable]. So it's something that's not wanted (authors' emphasis).

This account illustrates the ways the concept of a weed is simultaneously performed by people and plants. The context in which the interpretation occurs is important. Michael touches on this and demonstrates the role plant agencies play in constituting the scope and meaning of the term 'weed'. He observes how he initially encouraged foxglove (*Digitalis purpurea*) but because of this species' ability to reproduce and spread he has subsequently re-interpreted this plant as a weed.

Michael's account also reveals how personal encounters with a plant's agencies determine whether a plant is considered to be a weed. The importance of such encounters was equally evident in

other accounts. Alex talked about his attempts to eradicate convolvulus (*Convolvulus arvensis*) and how such encounters provide a means through which "you learn" to identify weeds: "you soon get to know that convolvulus is [*laughs*] [a weed]. It is very hard to dig it out and get rid of it. Man it was like a carpet, and it was so thick round there ... because it came from the back neighbour's as well. You soon learn to know what is a weed and what isn't [*laughs*]". Similarly, Catherine described how her 'battles' with Japanese anemones (*Anemone hupehensis* var. *japonica*) influenced her ideas about weeds:

> It can depend on the person [laughs]. Some people will say a dandelion is a weed whereas I'd say ... Japanese anemones [which] we've got in the garden [are]. Now I'd call them a weed because unless we are on top of them they can just spread and when I do weeding I battle them.

We thus see how people experience and encounter the non-human or planty agencies of plants through embodied and sometimes laborious weeding practices. Michael, Alex and Catherine in the course of controlling, digging up and pulling out these various plant species observe and reflect on their differing abilities to reproduce, grow and spread. As a consequence, the kin and progeny of these plants are routinely interpreted and practiced as weeds.

Moments of reflexivity can also occur through social interactions with others. Elizabeth recalled how an acquaintance had suggested she should remove a 'weed' on her property but had paid no attention to it as in her eyes the plant was aesthetically pleasing: "A weed is something that ... doesn't look good [and, therefore,] it comes out. Like someone said that something up our driveway is a weed [*puts on a different voice*] 'you should pull that out, it's a weed' ". I said "oh no it's all good, it looks good". If it looks good it isn't a weed [*laughs*]". Rebecca talked about how her conceptions had been shaped through social interaction, reading and personal experiences and observations of her garden:

> I don't know [how I've learnt about weeds]. I guess you learn from your elders. If you did pull out something and someone yelled at you, you thought oh I won't do that again [laughs]. ... Nowadays I'd look up a book or ask somebody or get them to come round and say "what do I pull out?" Like this garden, when I first came, it had been done over and so it was nice and tidy and then weeds popped up and I brought someone around who's a reasonably good gardener and she said that's a weed and that's a weed or this is such and such.... And I thought well I'll just leave it and see what it'll develop into because I don't know what it's going to develop into and then we got someone into just clean up all the trees, and ... all the weeds [have] grown back so all the stuff that looks weedy is going to go. So ... I suppose you just ask people and you learn from your mistakes, you pull up something oops (original emphasis).

Robert described how his thoughts had been influenced by having children, and in the process, discussed how he is comfortable having a single sycamore tree (*Acer pseudoplatanus*) on his property, but not its progeny:

> We've had some deadly nightshade [and] gone and intentionally taken out ... several of those and a couple of other berry things that no one else could identify because with kids little orange berries are great. So I would say those are weeds. Deadly nightshade is a deadly one when you've got little kids. To me a weed is something that might be alright but it's not where I want it. I mean I would see all these seedlings that are coming up from the [sycamore] tree, which is ok as a single, but I don't want five hundred of them in the garden. It is a weed.

Weeding and the multiple realities of, and possibilities for, native seedlings in gardens

Our research thus indicated that whether a plant is interpreted and practiced as a weed or otherwise will always be fleeting, volatile, improvisatory and contextually contingent (Crouch, 2003; Thrift and Dewsbury, 2000). People's gardening practices, therefore, create multiple realities and possibilities for native woody seedlings in different domestic gardens and within an individual garden. If a weed is constituted through the practice of weeding, numerous woody seedlings,[6] including self-introduced native Riccarton Bush species, have the potential to be classified as valuable plants, or as weeds, or as both, depending on age, growth, appearance and location, when found in domestic gardens. Kahikatea, the dominant canopy species, was the most common Riccarton Bush species we found dispersing and establishing in surrounding gardens (see Doody et al., 2010). After looking at the potted live seedling, presented at the time of the survey, Elizabeth, Ken and William,[7] all identified kahikatea as a species they had seen in their garden and had pulled out. Ken admitted to regularly pulling out other native woody species including lacebark (*Hoheria* spp.), akeake (*Dodonaea viscosa*), kohuhu (*Pittosporum tenuifolium*) and lemonwood (*Pittosporum eugenioides*). Michael, David, Joyce, and Jennifer, were among other interviewees who all indicated that they too pull a variety of native seedlings out of their gardens, mentioning cabbage tree (*Cordyline australis*) and karamu (*Coprosma robusta*), as well as the species identified by Ken.

A question of value or a matter of location?

So *why* do people weed native woody seedlings from their gardens? To suggest that they do not value these species would be simplistic. Many New Zealanders place great value on native plants as markers of national identity and belonging, and as low maintenance garden species (Spellerberg and Given, 2004). Our interviewees understood the conservation significance of Riccarton Bush and the importance of its kahikatea trees. Additionally, among those who acknowledged pulling out native seedlings, a number expressed an appreciation for native species and had them planted in their gardens. Ken recounted relocating a native kowhai (*Sophora microphylla*) seedling and had contemplated shifting a totara (*Podocarpus totara*), an approach others were following: Michael said that "[if] it [the plant] is something that I reasonably want and it's just in the wrong place I'll encourage it for a while and then transplant it somewhere else" (see Fig. 3). His suggestion that a native seedling can be in the "wrong place" demonstrates how a conceptual and practical differentiation is made between the various sections of a garden, ensuring that what is deemed to be 'appropriate' in one section may not be in another.

The survey findings reinforced this. Although, 66% of respondents indicated that they typically removed all emerging plants that they or previous garden owners had not planted,[8] the ways in which a self-introduced woody seedling was treated depended partly on the location in which it became established (see Table 4). Of those who indicated that seedlings grew in their flowers, 79% suggested they would remove everything not planted. In comparison, 67% would remove everything not planted in areas of shrubs and trees. A greater number of respondents also suggested they were

[6] We focus on native species but many of these arguments equally apply to exotic species.

[7] Kahikatea seedlings were found on Ken and William's properties and in soil taken from Elizabeth's.

[8] This calculation is based on areas of flowers, and shrubs and trees, as seedlings rarely established in lawns (6%) and only 52% of respondents had vegetable gardens.

likely to leave a liked woody or tree seedling to grow in areas of shrubs and trees, than in flowers.

The distinction between the ways seedlings and/or weeds are treated in sections of garden was evident in the interviews too. On some properties, such as Mary's, "anything [she] didn't plant" is a weed while on others it varies according to location. Jennifer alluded to this: "I like to keep the fence-line reasonably clear of things other than the camellias, the roses and the primulas so that they have a chance to keep going. [While in] the little patch out the front here ... we have always let things ... come up to see what they've been". Elizabeth, a self-confessed "non-gardener", focuses all her attention and efforts on only two sections of their garden: "[T]he only gardens [that] I weed [are] this one and the one out here. And there is nothing in it except roses and a couple of [bushes]. So anything other than those get[s] pulled out". These findings suggest that the survival of any woody seedling in a domestic garden is a personal and situational matter. The location in which a native seedling becomes established is one factor that determines its fate as it is either *practiced* as appropriate or as a weed.

So while in principle native plants are valued, in practice their appropriateness is determined by their embodied or actualised agency *and* location in the garden. Appropriateness rather than value appears to be an underlying motive for why people are pulling native seedlings out of their gardens. The appropriateness of a woody seedling is determined largely by people's aspirations for various sections of their garden (see Figs. 3–5) and their knowledge and/or interpretation of what that seedling is and will become.

Routine performances and the removal of native woody seedlings

The notion of appropriateness was well illustrated in the way respondents suggested they would treat the live kahikatea seedling in their garden. Forty-four per cent said they would, or probably would, pull the seedling out, while others suggested that its survival would be dependent on where it established in the garden, mentioning specific locations:

Susan Probably out in the flower gardens I would pull it out. If I saw it out there [in the native section] I would see what it did.

Anthony In the trees and the shrubs I'd leave it unless I happen to be hoeing. In other words, I wouldn't treat it in any ... special way.... In the flowers [and] ... the vegetables it would be pulled out.

Fig. 3. An area in Michael's back garden which he has predominantly planted out with native trees. Michael suggested that he would be happy to transplant self-sown native seedlings he wanted into this area.

The seedling again would be removed from the more formal sections of the garden, suggesting the removal of plants from these sections is a routine practice. The origins of this routine can be traced to ideas developed in early Victorian gardens and over time it has become an established gardening convention that is learnt and reinforced through experience (Nassauer, 1997; Raine, 1995) and repetition (Butler, 1990; Schechner, 1988). Weeding involves the reiteration of gestures, tasks and actions which conform to conventional "scripts, or the acting out of codes" (Szerszynski et al., 2003, p. 3). The weeding practices people learn to associate with some sections of the garden become so routinised as to appear natural (cf. Butler, 1990).

In conventional gardening terms any self-introduced plant or seedling encountered in these sections during weeding is repetitively *performed* as a *weed*. Similarly, plants capable of rapid, and sometimes rampant, growth, re-growth, regeneration, or spread in gardens are routinely encountered in the midst of weeding such as oxalis (*Oxalis* spp.), chickweed (*Stellaria media*) and milkweed (*Euphorbia peplus*), therefore, can become "common weeds" (see Roy et al., 2004). These plants only remain weeds, however, through being repeatedly performed into existence. As Jennifer (Section 'A question of value or a matter of location?') and Eileen below, highlight, the removal of such plants also helps to ensure that the survival needs (i.e., sunlight, space) are met for roses, primulas and other flowering plants valued for their colours and scent. This perspective is important in understanding the fate of native woody seedlings.

Appropriate performances and the fate of native woody seedlings

Our survey indicated that many respondents had difficulty identifying native plants. At the initial showing of the live kahikatea seedling, for example, 27% of respondents could not name it, and of the remainder who ventured an assessment, only 5% correctly named it as a kahikatea. A further 43% of respondents did, however, identify the seedling as being of native origin. This general inability to identify native plants (Doody et al., 2010), and their potential performances, also contribute to the removal of seedlings. Ken and Elizabeth, who both pulled out kahikatea on their properties, for example, were unaware of what the seedling was initially, and as for many of our respondents seeing the potted seedling showed them for the first time what the juvenile stage of the towering trees in the neighbouring Bush actually looked like. Ken observed: "I wouldn't have known that was a kahikatea at that stage". But once the identification was made, it was the performances of kahikatea over their lifecycle embodied in their seedlings that caused these gardeners to remove them from their gardens, as William explains:

> We get a lot of plants coming up because of ... Riccarton Bush ... and we simply can't let them all grow. [W]hen I came here [the] garden out there [was] all over the place ... and there were kahikatea coming up everywhere. So the birds just eat the berries and they come and leave them here. And they germinate and mostly I'm going to have a kahikatea forest out here [if I do not pull them out]. That is pretty obvious.

William's sentiment that the performances embodied in woody seedlings may not be appropriate in the context of his garden was echoed by others. Eileen said that the reason why she pulled a seedling out of her garden is related to the size of her property and the plants she wants to have in her garden:

> I haven't got room for anything to grow terribly big. And it's a tree. I don't need any more trees here. The ones that I've got here are going to get too big before too much longer anyway. [...] I like trees but I think this [property] isn't big enough to

Table 4
The main approach used to treat self-introduced woody seedlings when they established in different areas on the property.[a]

Statement	Percentage			
	Lawn	Flowers	Vegetables	Shrubs/trees
I don't get any self-introduced plants in that section	93.8	2.4	34.8	0
I remove everything that's not planted	6.2	77.4	60.9	66.7
If it is something I like I will let it grow there	0	10.7	2.2	20.2
If it is something I like but don't consider appropriate for that area I will transplant it	0	4.8	2.2	6.0
I leave everything to grow in that section	0	1.2	0	3.6
Other	0	3.6	0	3.6

[a] Due to the error associated with rounding columns do not always total 100%.

Fig. 4. Simon's rose garden as seen from the footpath. This is one of the few areas he actively maintains to demonstrate that his property is looked after and lived in for both personal pride and security reasons. Anything not planted in these sections of garden were routinely removed.

Fig. 5. One of a number of areas on Simon's property planted out in mainly shrubs and trees. By leaving these areas to largely "do their own thing", he has significantly reduced the amount of work he is required to do in the garden. Areas as such these on Simon and other people's properties provided spaces in which self-introduced plants could potentially to seed, grow and establish.

> have trees that are too big [as] I like to have roses and flowers as well as foliage type plants. If you get too many trees the canopy is going to block out the light and things aren't going to flower. And because of the [relatively small] size of the section I feel can't have larger trees. We've got smaller ones and keeping those to a certain size.

We thus see that in domestic gardens adjacent to Riccarton Bush the routine and embodied performances of woody native seedlings, particularly of potentially large species such as kahikatea, which are seen as so valuable by conservationists wishing to protect and enhance this forest remnant, are often interpreted by gardeners as inappropriate. These seedlings are thus routinely practised as weeds and removed.

Conclusions

In this paper we have used the concepts of performance, non-human and planty agencies to examine how some plants are continually *performed* as weeds in domestic gardens surrounding Riccarton Bush. In developing this account we have attempted to contribute to existing debates in three ways. Our first contribution is to literatures on human–plant relations and non-human and planty agencies. Here, we have attempted to further earlier ANT-inspired research on domestic gardens. Hitchings (2003, p. 103), for example, emphasised the way in which gardens are produced by people and plants "working together". In contrast, Power (2005, p. 43) sought to move beyond this "harmonious" account by identifying moments of conflict which make "gardening a lively and dynamic pursuit". Following Power (2005) we have charted the dynamic relationship that emerges between people and plants as the garden is constantly made and remade.

More specifically, we have been attentive to how people experience and encounter the volatile, unpredictable and disruptive non-human and planty agencies of plants. Through such encounters people observe and reflect on plants' differing abilities to reproduce, grow and spread. This includes the ways the embodied or actualised agencies of some plants, including self-sown seedlings, can influence and/or threaten the survival of other plants and their desirable performances. Such influence can extend to plants taking complete control of the garden. In this way plants can disrupt and unsettle people's experiences of, and ascription of meaning to, their home and garden. Moreover, we have also sought to contribute to ongoing discussions about plantiness and planty agencies (Brice, 2014; Head et al., 2012) by examining how weeds are (re)constituted by natural scientists and gardeners. Corresponding with Brice's (2014) account of the way crop plants influence seasonal labour patterns in viticulture and wine production, we have attempted to show how plants are active participants in the social lives of gardeners seeking to control them, and scientists who continually attempt to classify, predict and assess their risk.

Second, our empirical research has again demonstrated that interviews and garden tours are useful modes for understanding relational encounters between humans and plants (Hitchings and Jones, 2004; Power, 2005). We have shown how the presence of a live potted seedling helped to facilitate a particular type of human–plant encounter. The seedling enlivened discussions with participants and encouraged them to be reflexive about how they encounter and engage with self-introduced plants in the course of gardening. This lively presence helped us to understand how people interpret and respond to the embodied agency of kahikatea. In our view there is much scope to further explore botanical encounters within social science research.

Third, our findings can potentially inform weed management and plant conservation initiatives. This paper has critiqued the notion that people do not allow self-seeding native plants to mature in their gardens simply because of their values and a lack of awareness. Native plants can be performed as valuable plants, or as weeds, or as both, depending on age, growth, appearance and location, when found in different domestic gardens and within an individual garden. Their treatment is always dependent on context and, consequently, the realities of seedlings performed in a garden is always momentary, unpredictable, improvisatory and *multiple*. The context in which weeding is undertaken is itself always changing, in flux, as it comes into being in the midst of the performances of the people and non-humans who occupy the garden together (Bhatti, 2006; Power, 2005).

Recognising this multiplicity we have a responsibility to consider which types of realities we want to enact (Mol, 2002). Native plants are important for numerous reasons and we support central and local government policy in New Zealand which promotes their conservation. In cases where there is the potential for domestic gardeners to contribute to native plant conservation understanding how gardens might be (re)performed in ways which provide opportunities to accommodate these species will be useful. Our findings suggest that an emphasis will have to be placed on the non-conservation roles and meanings of gardens and how people make sense of plants as they experience and encounter their performances and agencies through taken-for-granted embodied practices (Crouch, 2003; Macnaghten, 2003; Head and Muir, 2006). The limited success of information campaigns to date (see Blake, 1999) is partly attributable to a lack of knowledge on the part of some campaign managers of these roles, meanings and sense-making processes.

Rather than adopting an information-deficit model (Blake, 1999), weed management communication and native plant educational campaigns would benefit from recognising varying degrees of lay knowledge and understanding. Thus, attempts to enhance the role gardens play in sustaining urban remnants such as Riccarton Bush might be made more effective by adapting existing initiatives in ways which take account of that knowledge and understanding. A good example of such a possibility is 'plant' or 'grow me instead' brochures that identify native and exotic plant species which are similar to, and can be used as, alternatives to pest plants or environmental weeds (DOC, 2005; IPCBC, 2013). These brochures attempt to recognise and accommodate the types of agencies and performances domestic gardeners' consider appropriate for their gardens. In areas surrounding Riccarton Bush or other remnants they could promote locally rare plants. Given concerns over loss of sunlight and shading, smaller and attractive understory Bush species such as *Coprosma rotundifolia* (reaches 4 m) and *Lophomyrtus obcordata* (reaches 5 m) will be more suitable. Consequently, larger canopy species like kahikatea might be accommodated in public streets, parks and reserves.

Such work has already begun in other parts of New Zealand. The Nature for Neighbourhoods Project which aims to enhance gardens surrounding streams and native forest patches in Auckland is a good example (Kaipataki Project, 2014). Residents are engaged through the provision of free on-site garden consultations, information on suitable plant species and weed control and free native plants. This initiative involves homeowners, but more importantly, ensures plants are materially and actively engaged in the process. Our use of the live kahikatea seedling revealed, facilitating such encounters can be a means for generating reflexivity and moments of curiosity, interest and awareness (see Lorimer, 2007). Cultivating interest will be important as it is unlikely that Riccarton Bush species will form self-sustaining populations in gardens without human collaboration (Doody et al., 2010). By focusing on weeding we have highlighted the possibility that domestic gardens might be (re)performed in a manner that allows Riccarton Bush to extend into neighbouring properties, at least in a limited form, and help to ensure the survival "of the last tree association of its kind" (Cockayne, 1924, p. 13).

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